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GOVERNMENT DOCUMENTS

Proposal for 1980 fieldwork programs on the Hamilton-Scourge project by Atlantic Marine + Diving Co

AMD
ATLANTIC MARINE
AND
DIVING CO. LTD.
TEL.
(506)-455-3720
FREDERICTON, NEW BRUNSWICK

AMD
Atlantic
Marine and Diving Co. Ltd.

500 Beaverbrook Court
Fredericton, N.B.
Canada E3B 5X4
Telephone: (506) 455-3720
Telex 014-46208

January 23, 1980

Mr. J.R. Jones, Secretary
Hamilton-Scourge Steering Committee
c/o City Hall
71 Main St. West
Hamilton, Ontario
L8N 3T4

Dear Mr. Jones:

Further to recent discussions regarding the 1980 Hamilton-Scourge fieldwork, I wish to submit the following proposal.

This proposal has been prepared, stressing the practical engineering aspects and logistic support and their economic considerations. As a result, parameters include, but are not limited to:

- Safety
- Damage to vessels
- Entanglement
- Flexibility
- Stability in various sea states
- Positional status and recording
- Back-up equipment and personnel.

It is not possible to guarantee the positional accuracies requested by the Hamilton-Scourge Committee and yet remain within the cost structure felt to be acceptable.

It is, on the other hand, possible to offer sound, technical, and practical techniques and equipment required to approach this goal.

Obviously, logistics may dictate disproportionate costs, therefore, we have presented a cost structure providing flexibility to the committee.

This proposal is valid for 30 days from receipt hereof, otherwise it is null and void.

Thank you for the opportunity of presenting this proposal.

Sincerely,

John McFadzen
General Manager
/ew

TECHNIQUE

It is felt that the photographic, item location and identification objectives will best be achieved via a controlled surface suspended system.

Support for the system has been designed in terms of the following factors:

PRIMARY

- Stability
- Suspended equipment, positional control and status
- Support platform and shelter for equipment and crew
- Rapid mobilization and demobilization and emergency abandonment
- Flexibility
- One-time anchor positioning (each ship)
- Unsinkable (No damage to ships)

SECONDARY

- Data analysis and recording - on site/off site
- Equipment repair and storage
- Rapid transportation
- Accommodation and meals
- Communications

OPTIONAL

- Increased accuracies of grid locations through electronic equipment
- Remote artifact recovery capabilities
- Data memory through micro filming

PRIMARY SUPPORT DETAILS

The semi-submersible design feature is not new. It is a proven technique on large scale oil drilling platforms affording greater stability in heavy seas. The support platform shown in Drawing #1 will be positively bouyant. By putting flotation inside of the pontoons, the platform will be virtually unsinkable. The 4 point anchoring system will be used to pull the support pontoons below the surface. The frame that extends above the surface will support the work platform. Because of the rapid mob-demob and emergency abandonment consideration, it is desirable to keep the size of this platform down to a minimum and use it only as a deck space. All operational equipment that requires time consuming set-up and take-down time would be kept on board the support vessel. This feature enables a day-to-day operation rather than 24 hours. A second support vessel smaller and preferably capable of steaming at 20 knots would be used as a taxi between site and base.

The X-Y axis for grid positional control and status of the suspended equipment will be achieved through the simple slide rail system. The position of the platform will be tied into shore bench marks.

SECONDARY SUPPORT DETAILS

DATA ANALYSIS AND RECORDING

On-site data recording will include:

- Single-roll black and white developing
- Video tape recording and playback
- Audio recording and playback
- Hand written notes and grid charts
- Item identification and location

Off-site data recording will include:

- Photo lab multiple-roll developing
- Categorizing and recording relative grid locations
- Micro-filming data (optional)
- Video tape editing and filing
- Item identification and location

EQUIPMENT REPAIR AND STORAGE

On-site equipment repair and storage will include:

- Component spares for key equipment
- Spare parts kits
- Portable electronic test equipment and schematics
- Appropriate congestion avoidance storage

RAPID TRANSPORTATION

Rapid transportation will be necessary to transport personnel, equipment, film, meals, miscellaneous supplies etc. to and from the work site during operations. A powerboat with twin engine power capable of steaming at minimum 20 knots and equipped with a V.H.F. radio will be used.

COMMUNICATIONS

The operation will require the following minimum equipment:

- 4 V.H.F. radios with 1 private channel and local navigational and weather information channels.

These radios will be located at base station, support vessel, rapid transport vessel and one spare.

- Walki talkies (optional)
- Ship-to-shore telephone (optional)

SUSPENDED PACKAGE COMPONENTS

Stereo Hasseblad 70 MM, 2 1/4 x 2 1/4 format with 70 shot back (500 shot optional) has been selected as the most suitable for

this work. Wide angle water corrected lens with short focal length operated remotely and guided by a hydro products T-C 125 low light video camera with remote focussing.

Still shot lighting will be fixed at an oblique angle to the optical axis. Strobe intensity can be decreased or increased by fireing one or more strobes for each camera in synchronization. A 250 watt thalium iodide light will provide illumination for T.V. and may be used to forelight stills.

A selection of filters and 400 to 1600 ASA Tri-X film will be available to insure proper contrast and bracketing procedures will insure correct exposure values.

The above equipment will be mounted inside of a hydro dynamically designed, air compensated housing. The air compensation will be automatically controlled with a pressure differential valve. The smooth lines prevent entanglement and adjustable bouyancy control will reduce drag effects, and consequently positional status will be enhanced.

Pneumo fathometer readings could be taken at each location providing further data for analysis. Reliable readings can be obtained utilizing a simple pneumo fathometer. The results could be presented on a Dimen-Plot, 3-D plotter.

Data recorded on each still will include the following:

- Day
- Hour
- Minutes
- Seconds
- Print #
- Compass heading

The positional accuracy of the method described above is enhanced with the use of a remotely operated vehicle. This vehicle will handle the following tasks.

- Assist positioning of suspended package (if required)
- Provide additional moveable light source
- Inspect areas surrounding ships
- Possible recovery of artifacts
- Miscellaneous inspections.

In projects of this nature, our firm has made arrangements typically to draw upon an expert resource pool such as:

1.	Professor S. Oliver	Photogrametry - University of New Brunswick
2.	Louis Nadeau	Photographer - N.B. Archives
3.	Prof. Louis Torfason	Mechanism and Machine Design
4.	Carl Risteen	Mechanical Engineer - N.B.E.P.C.
5.	Jim Wilson	Toronto General Hospital - Hyperbaric Unit
*6.	Robert Turner	Design and Operations
*7.	John McFadzen	General Manager - Atlantic Marine & Diving
*8.	Robert Starr	Underwater Services Ltd.
*9.	Steve Johnson	Underwater Services Ltd.
*10.	Peter Sare	Diver
*11.	T.J. Foulkes	Remote Vehicle Design

* Resumes are enclosed.

COST STRUCTURE

Atlantic Marine & Diving will provide supervision, labour and equipment as outlined in our scope of work of this proposal for the following costs:

Mobilization	Lump	$ 165,000.00

Includes:
- Prefabrication
- Equipment and four personnel moved to site, set up.
- 3 day field test

The following equipment for a 2 month period:
- pontoons
- 1 UDats T.V. System with spares
- shallow diving equipment
- generator (Capacity?)
- 1/2 ton vehicle (including gas)
- small tools
- marker buoys
- miscellaneous steel
- suspended housing
- shore based shelter (Why not rent?)
- still shot developing equipment (single roll developing)
- navigational lights and batteries
- anchor chain and anchors (Length + Wt?)
- mooring lines
- strobes (How many?)
- still shot cameras and related remote accessories
- slide rail assembly
- 6 tuggers or tirfors
- umbilical

DAY RATE (to commence immediately following 3rd test day)

Includes:
- remote controlled vehicle (Hydro psi?)
- electronic test and repair equipment (Why?)
- video recording and editing equipment (What?)
- personnel (4 people) (12 hr. day max.)
- insurance (liability $1,000,000.00)
- workmen's compensation
- fuel, oil, grease
- accommodations (4 people)

= $ 3,700.00 per day

Down time?

Items not included in day rate that could be supplied by H.S.S.C. or by Atlantic Marine & Diving.

- support vessel
- rapid transit vessel
- surface positioning equipment.

If supplied by AMD = $ 1,250.00 per day

Demobilization equipment breakdown and return to our plant $15,000.00

Expendables will be charged at cost plus 10% overhead plus 15% profit, including but not limited to the following:

- film and developing
- video tapes
- filing supplies and grid drawings

The cost of expendables cannot be accurately determined at this time due to various contingencies, however a budget figure for this item is $500.00 per day.

What's in it?

Report Preparation Lump Sum $ 5,000.00

The following is to be supplied by Hamilton-Scourge Steering Committee:

- expendables (as above)
- hard marker on each vessel
- archaeological representative to assist in identification of artifacts.
- ship traffic control

Cost and related equipment details on the following options are available on request.

- electronic bottom referencing equipment
- recovering of artifacts by remote means
- shear vane soil tests - diver operated
  - remote
- core samples of hull timbers - diver operated
  - remote
- clean water close up adaptor for suspended package.
- micro filming data

The results of the field test will reveal data recovery rates to be expected with this system. Preliminary estimates indicate 10 days per vessel should provide sufficient material for a cost effective analysis of the condition of the vessels and their salvageability.

R E S U M E

NAME: John McFadzen

ADDRESS: 500 Beaverbrook Court
Fredericton, N.B.
E3B 5X4

Telephone: (506) 455-3720

PERSONAL: Married, Two daughters

HEALTH: Excellent (Medical Certificate attached)

PRESENTLY: General Manager of Atlantic Marine & Diving Co. Ltd.

EDUCATION
- High School Graduation (Fredericton High School 1971)
- Applied Science Degree in Underseas Technology (Highline College, Seattle, Washington 1974)
- Professional Association of Diving Instructors

COMMITTEE MEMBERSHIPS

(1) C.S.A. Executive Committee for Diving and Caisson Systems

(2) C.S.A. Main Committee for Diving and Caisson Systems

(3) C.S.A. Sub-Committee for Commercial Diving Standard Z275.2

(4) Working Committee for Revision of N.B. Occupational Safety Code for diving operations. (Inactive)

(5) Department of Health - Occupational Health and Safety Co-Ordinating Committee (Guest).

SYMPOSIA ATTENDED

1976 - 3 Days - Association of Diving Contractors, New Orleans.

1977 - 3 Days - Association of Diving Contractors, New Orleans.

1978 - 2 Days - Defence and Civil Institute of Environmental Medicine, Toronto (Guest Speaker)

1978 - 1 Day - Canada's Ocean Industry Conference, Halifax

1979 - 2 Days - Defence and Civil Institute of Environmental Medicine, Toronto

RELATED EXPERIENCE IN CHRONOLOGICAL ORDER

1974 - Diving Bell Operator for Post Graduate Student at University of Washington during his mueon photographic experiments.

Console operator at Virginia Mason Hospital during evaluation dives on surface decompression with oxygen. Also participated in several dives, 1 to 400 for 1 hr. Bottom time requiring 19 hrs. decompression.

Supervised replumbing of Atlantic Marine and Diving recompression chamber to meet Canadian Coast Guard Standards.

1975 - Project Superintendent for core drilling operation at site of proposed Lorneville Deepwater Port. The project lasted three months and employed 12 divers.
Over 1500 man hours were spent on the bottom. Surface decompression on air was used on all dives. "World's First Submerged Drilling Operation in Excessive Currents and 30' Tides." (Refer to Item A)

Supervised evaluation of prototype trench excavating device built by Atlantic Marine & Diving for Montreal Engineering for N.B./P.E.I. Power Cable Interconnection (Refer to Item B)

1976 - Supervised diving operations and surface decompression during cable plow tests in Northumberland Strait for Seiverts Kableverk of Stockholm, Sweden.

1977 - Project Superintendent for diving operations for N.B./P.E.I. Power Cable installation. 25 divers working two 12 hour shifts during cable laying, logged some 500 hours of bottom time. Work before and after cable laying amounted to an additional 3000 hours of bottom time. Also utilizing surface decompression techniques. (Refer to Item C)

1978 - Project Superintendent for pipeline installation at Perth-Andover, N.B. Responsible to Godfrey Associates, Engineering Consultants for complete installation, burial and testing of 2000' of 10" diameter ductile iron pipe under the Saint John River. Project completed on schedule and within budget. Four divers were used logging approximately 500 hours over the three month project. Surface decompression was not used due to shallow water depths - 35'.

Carried out Market Analysis for Halifax firm purchased by Atlantic Marine. The Firm "Undersea Equipment Ltd." manufactured saturation diving equipment for depths to 1500 feet.

Co-ordination of personnel and equipment for diving operations on the Deer Island to Campobello Island submarine cable installation. Approximately 500 hours of bottom time logged by 7 divers. Surface decompression used as required.

1979 - Project Superintendent for diving operations during the Campobello-Grand Manan Island submarine cable installation. Also supervised cable suspension corrections and necklace installation. Approximately 500 hours of bottom time logged by 6 divers.

Supervision of daily diving activities during construction of sub-structure at the Westmorland St. Bridge in Fredericton. Approximately 1500 hours of bottom time logged by several divers over the length of the project. Water depth 35' - surface decompression not required. (Refer to Item D)

During the period 1974-1979 Atlantic Marine & Diving crews have logged several thousand hours of bottom time on smaller jobs not mentioned above, including work in Resolute Bay. The logistics of these operations have been my responsibility.

I have worked with the following people, any of whom would be happy to comment on my character and ability.

Mr. Tom Bell, Manager of Utility Engineering
New Brunswick Electric Power Commission

Mr. Andy Biggar, Montreal Engineering

Mr. Reid Giffen
FENCO Consultants Ltd.
Fredericton, N.B.

Mr. Ken Montgomery
Maritime Electric Ltd.
Charlottetown, P.E.I.

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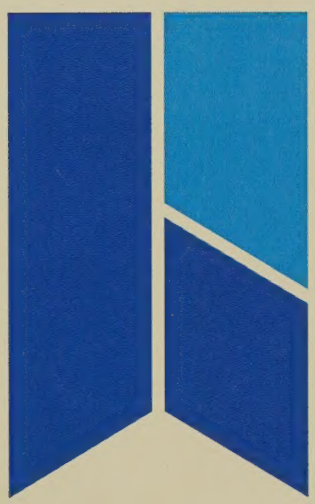
Insert to Be Photographed at a Later Date.



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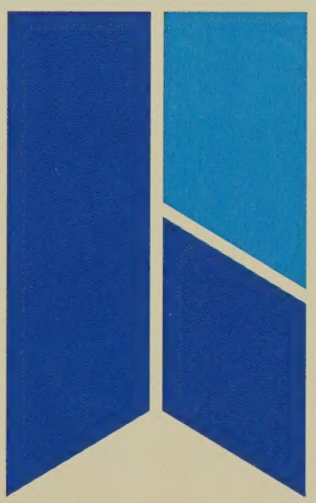

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Re: REVIEW ON CORE SAMPLING IN 100' OF WATER

Purpose: TO DETERMINE TYPE AND STRENGTH OF BEDROCK

Company: ATLANTIC MARINE & DIVING CO. LTD.

In the Spring of 1975 Atlantic Marine & Diving received a contract to retrieve core samples under 100' of water at the proposed site of the new deep water port at Tiner Point, N.B. The severe conditions that existed at this site had already defeated attempts of previous drillers. Problems they encountered were 30' tides, up to 3 1/2 knots currents and sudden strong winds, a common occurrence in the Bay of Fundy area.

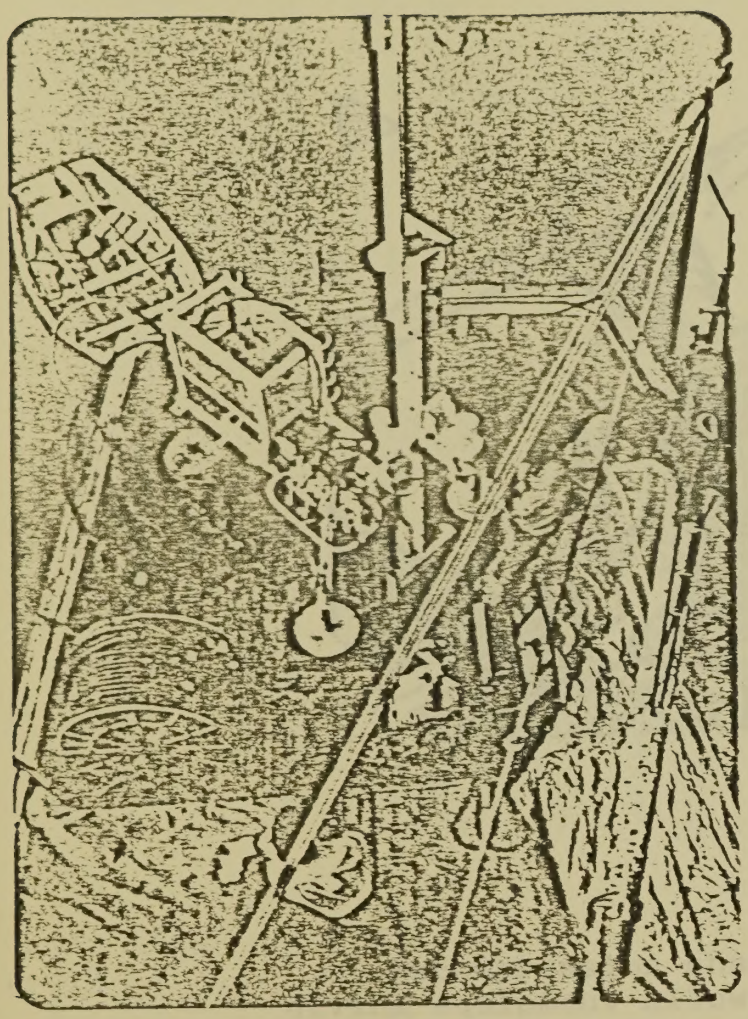
Atlantic Marine activated a new concept in underwater drilling, a submersible drill rig that was lowered to the sea floor and powered through a quick-disconnect umbilical from a hydraulic power supply located at the surface on a fishing boat. Each day the hoses would be connected and disconnected in minutes by a diver, obviously giving the system an enormous advantage over sudden winds. A permanent 5 point mooring system held the boat in daily tidal rips from the Saint John River.

The divers first drove casing to refusal with a 300 lb. hammer operating the Cat-Head to lift the hammer, then releasing it. 30 - 40 blows per minute was normal. Up to 30' of boulder type overburden was penetrated in this manner. The next step was to "clean out". This was done by driving a 5' sampler inside of the casing and retrieving a sample of the overburden at the same time. Once bedrock was reached the N-Q wire-line core barrel was put in the hole. This method of drilling would allow 5' samples of bedrock to be taken each time without pulling the drill string. An undetermined amount of time was saved at each hole due to this procedure.

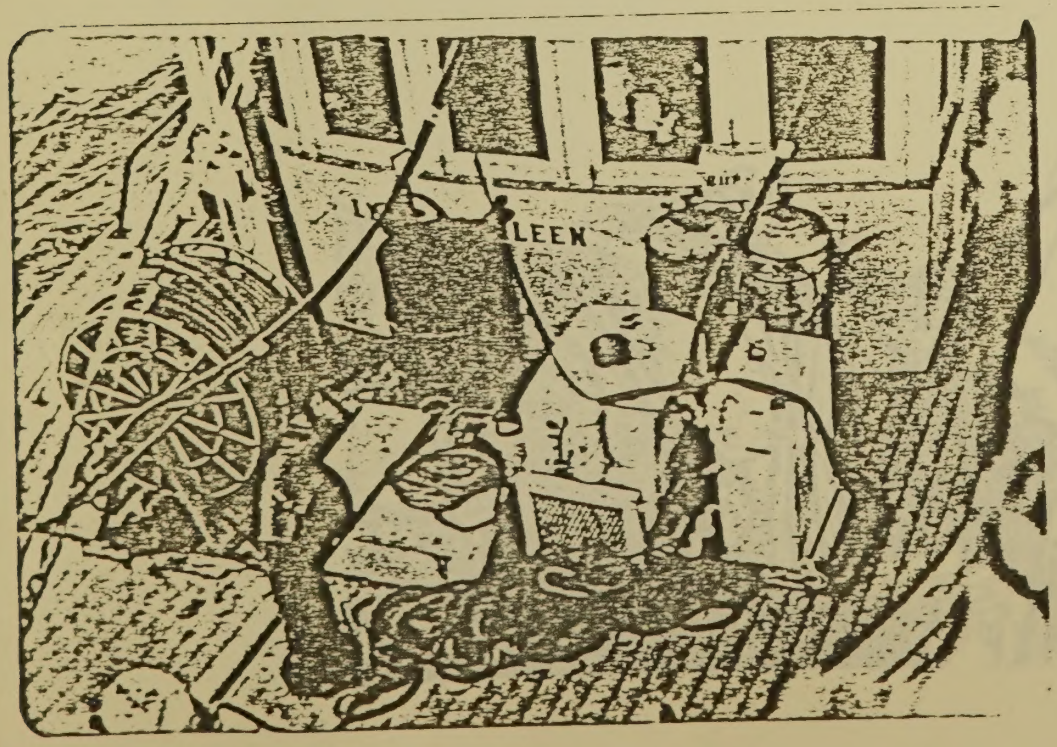
The process was all carried out by divers under 100' of water hampered by tidal rips of up to 3-1/2 knots, sudden winds and impossible soil conditions. The divers used surface maintained diving equipment with communications and were under constant supervision by two drilling technologists who could assist the divers when common or uncommon drilling problems arose. One problem that did occur was a dog-leg in the hole caused by drilling through a fault or gap in the bedrock. This was overcome by reducing the size of the wire-line from N-Q to B-Q. This enabled the drill string to by-pass the bend in the hole allowing the drillers to finish the hole rather than abort it and move to a new location.

The rock that was retrieved was fractured so badly that geologists on site were surprised that the recovery rate was so high, 97%. All samples were placed in core boxes and immediately inspected and recorded by an engineering technician. The information was later reviewed by the consulting companies and major changes were made in the basic design of the terminal.

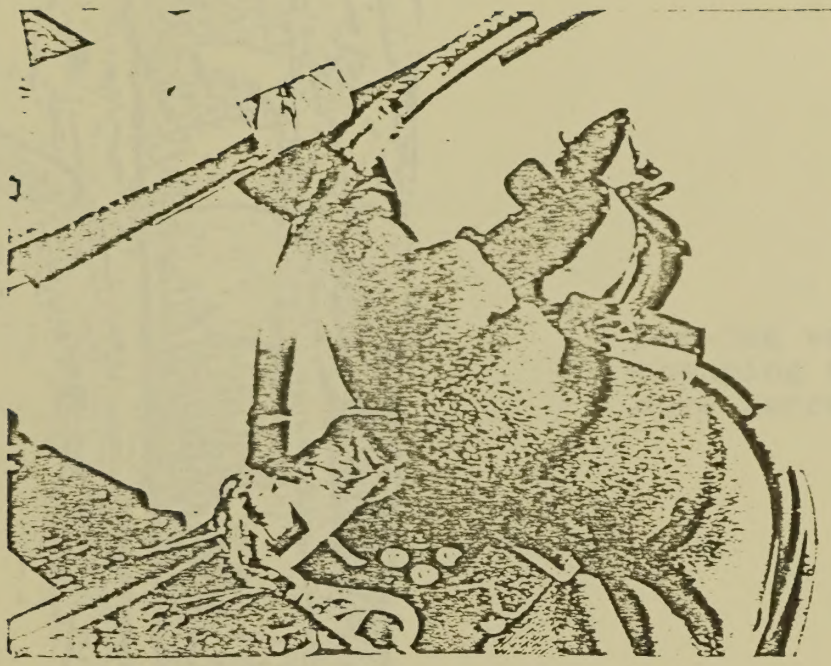
ew/hm
79-11-28



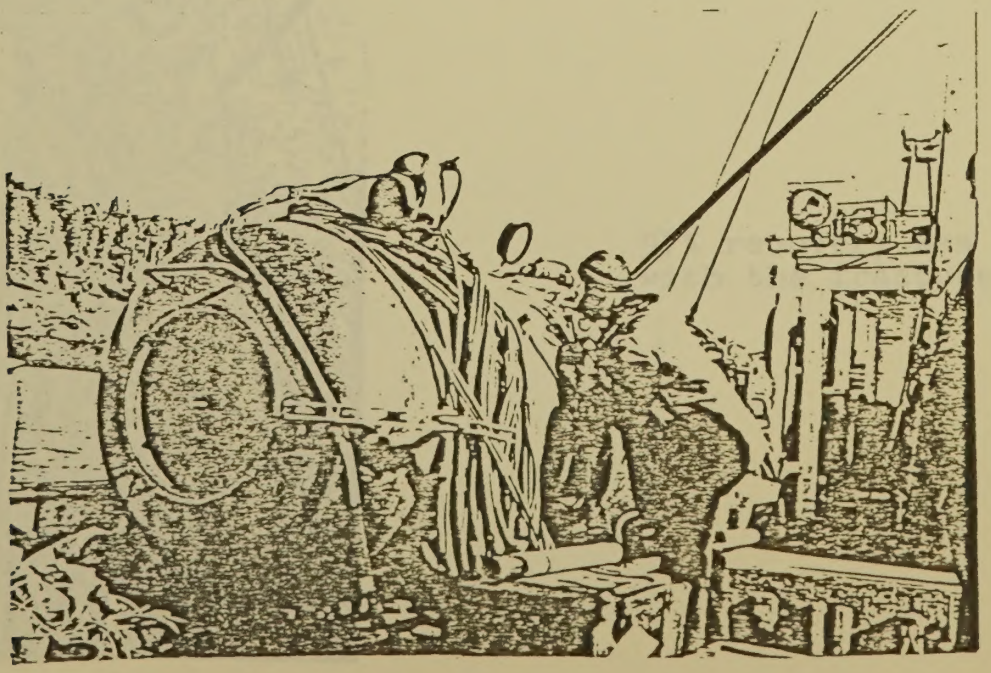
Portable hydraulic rig

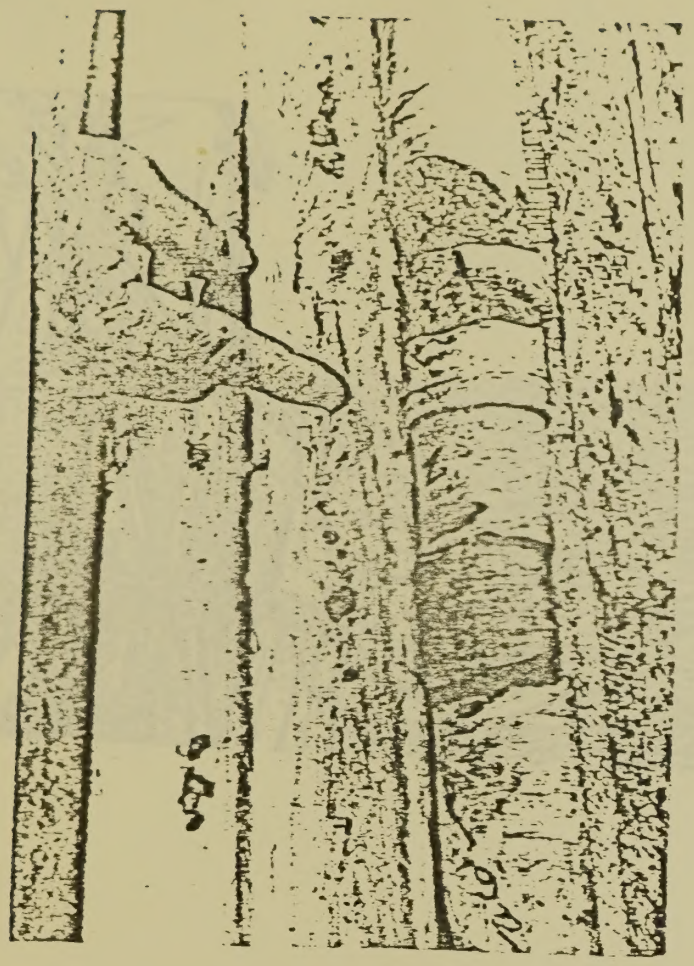


Hydraulic power supply and hose reel.

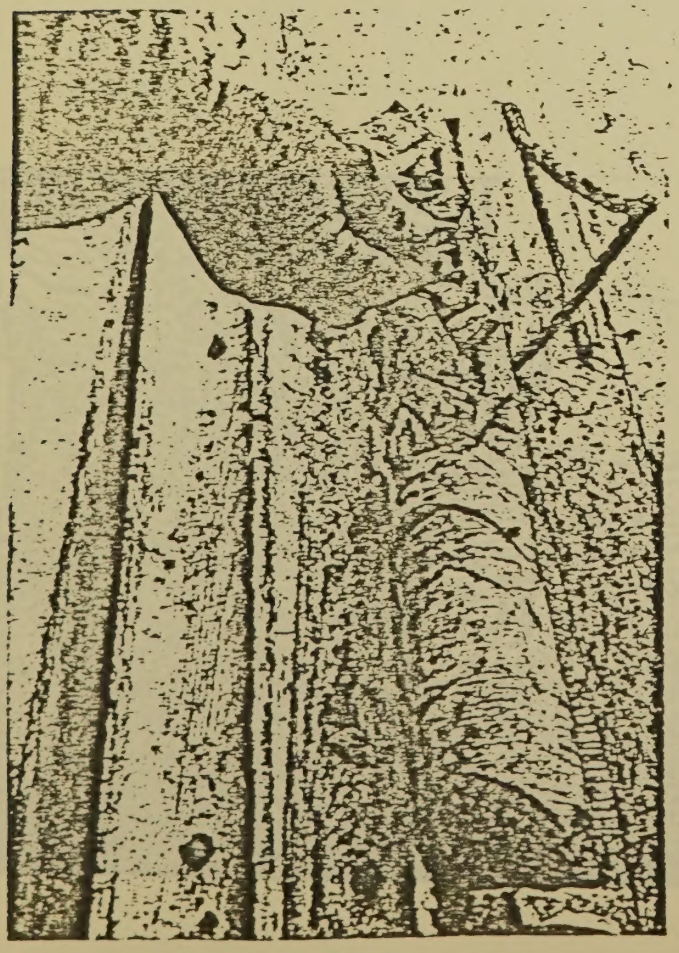


Recompression chamber and surface maintained diving equipment allowed longer, safer diving time and necessary communications between divers and surface support

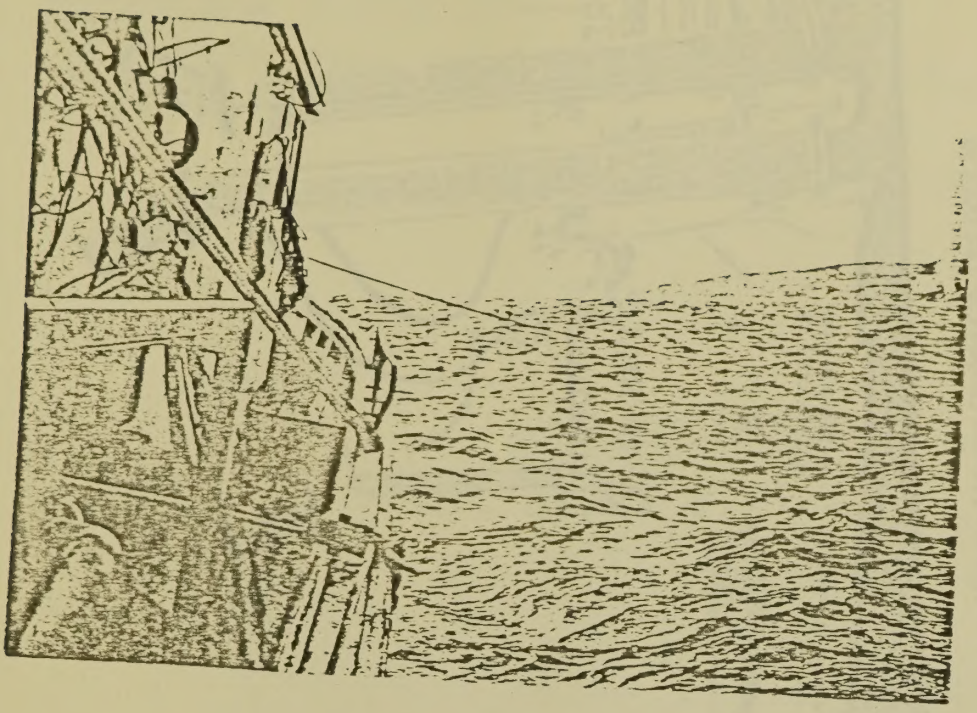




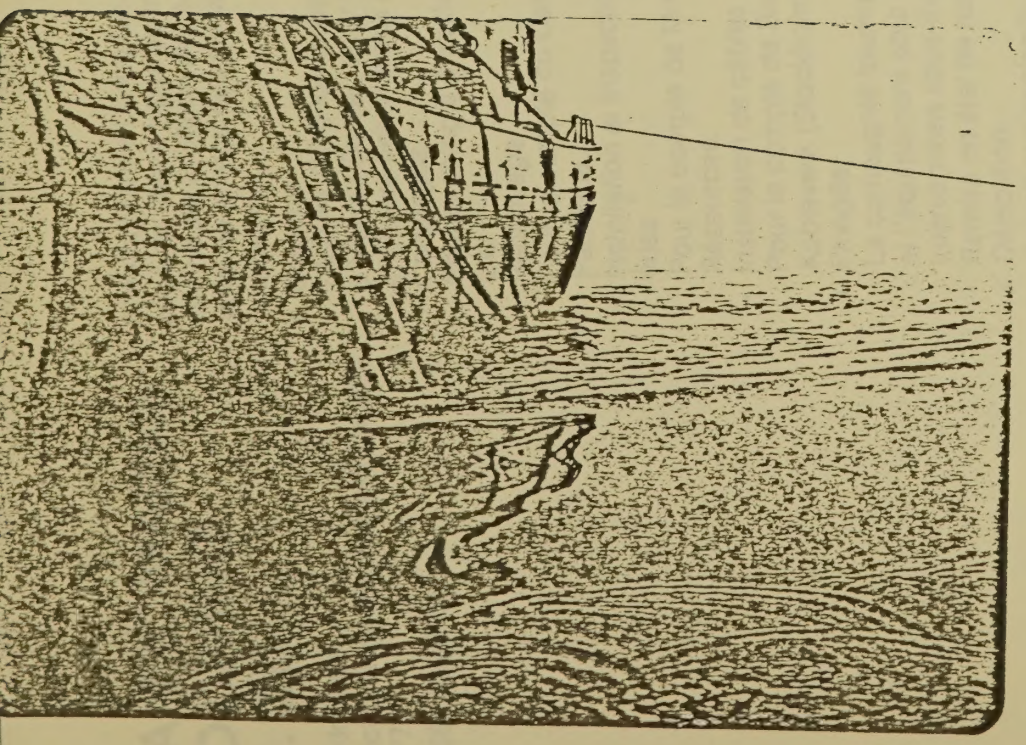
Dog-leg was overcome by changing the size of the core barrel.



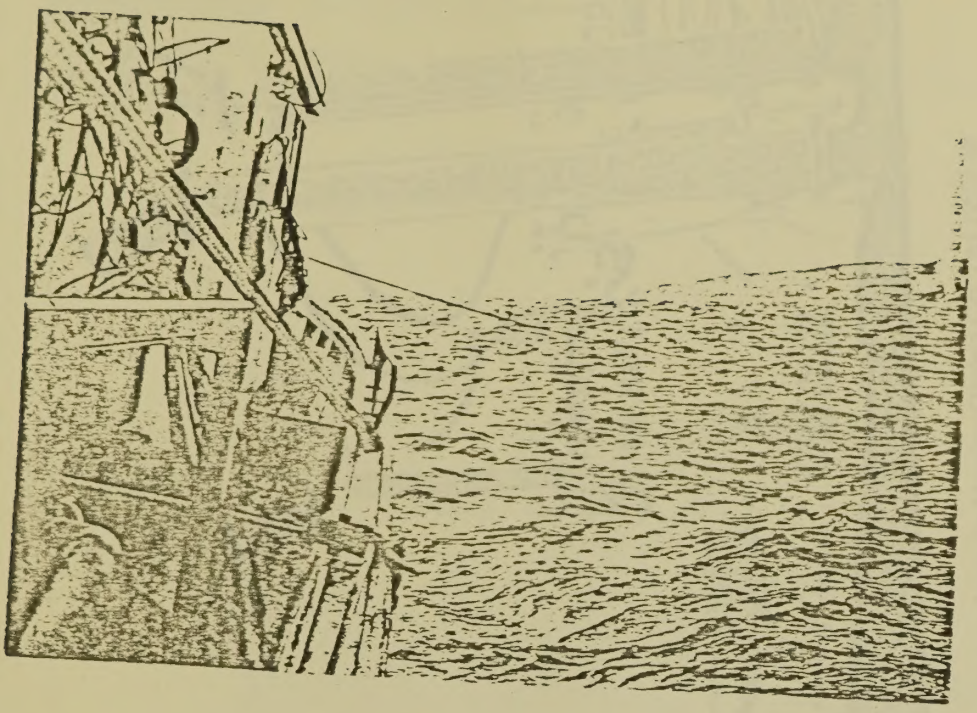
97% recovery was surprising with the fractured rock.



Drilling opperations could be carried out in moderate winds.



3 1/2 knot current



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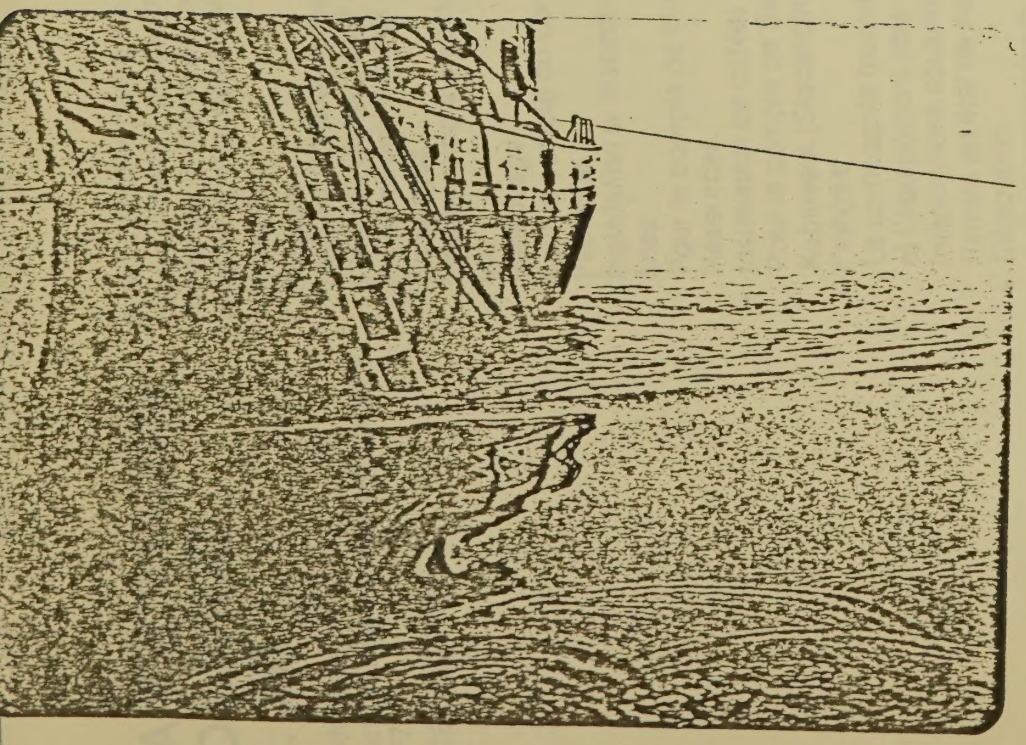
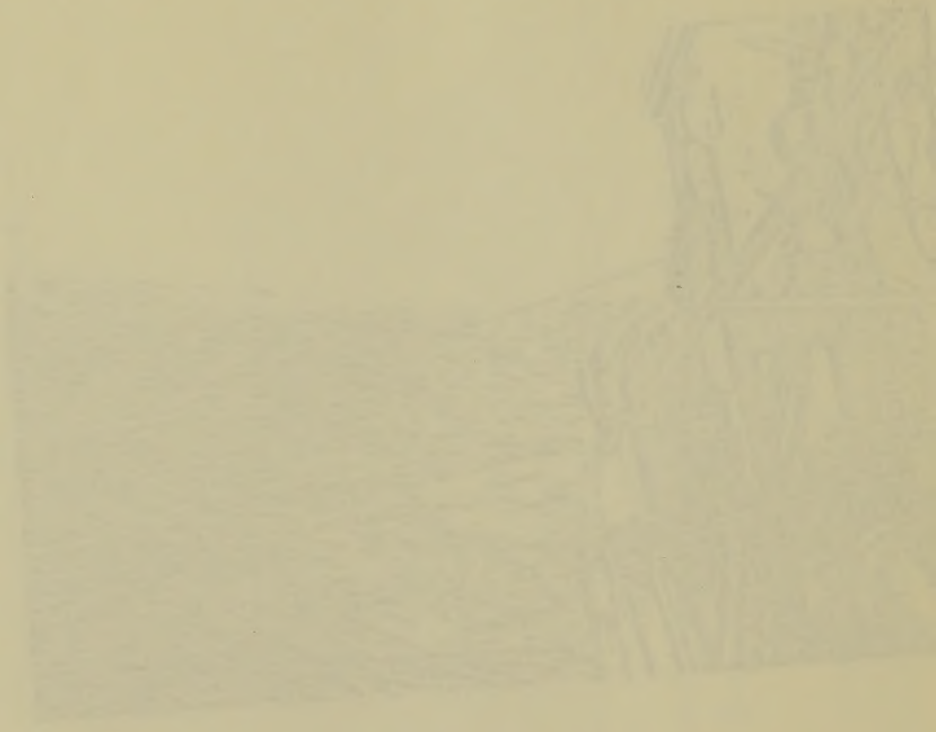
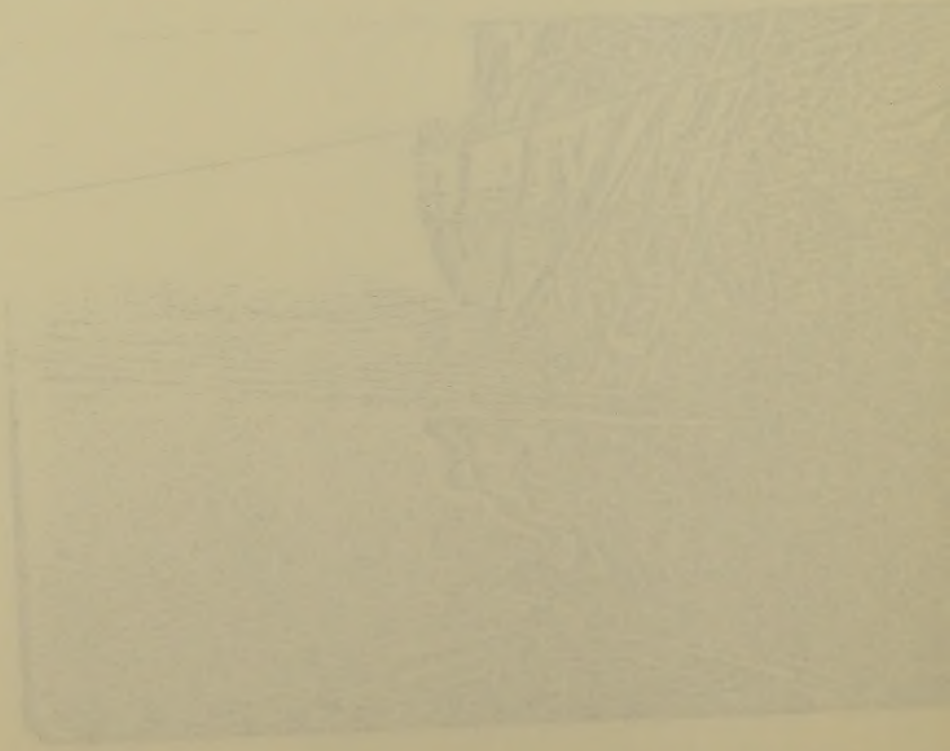


3 1/2 knot current



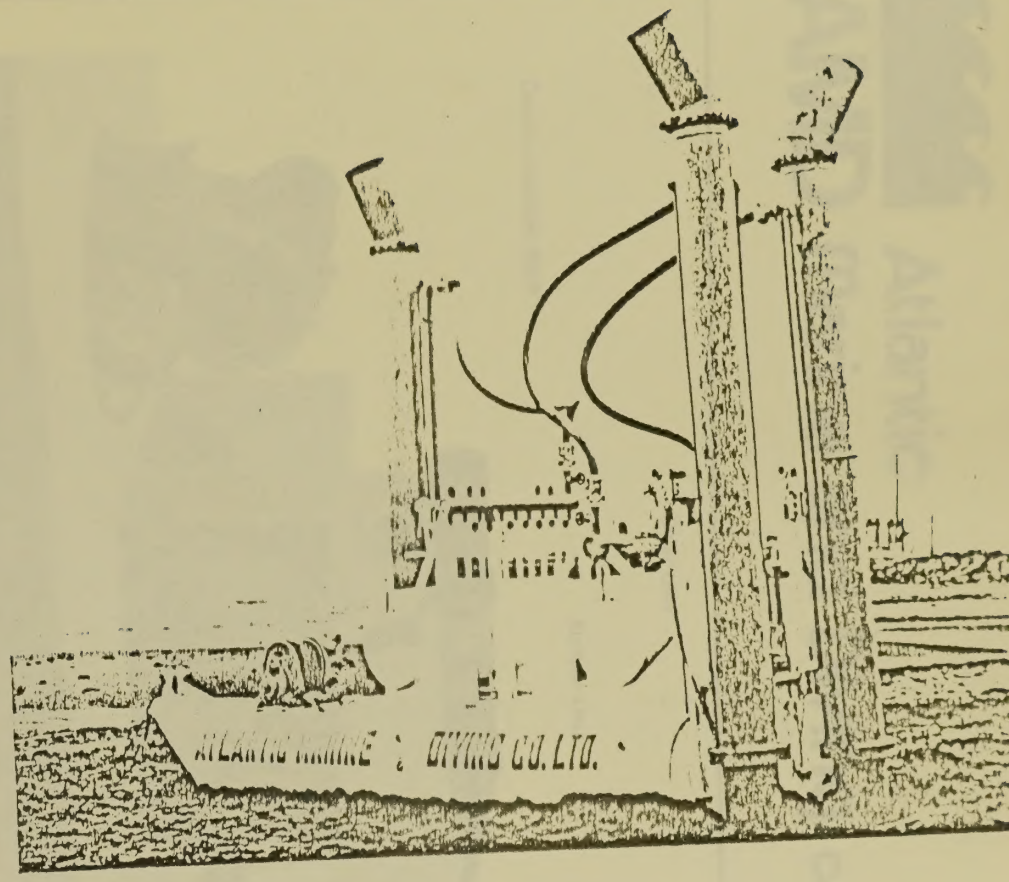


ATLANTIC MARINE AND DIVING CO. LTD

476 York Street
Fredericton (New Brunswick) Canada
E3B 3P7
Tél. (506) 455-3720

Atlantic Marine Diving Co. Ltd s'occupe de divers types de travaux sous-marins sur le littoral des Maritimes. Voici un aperçu des activités de cette compagnie:

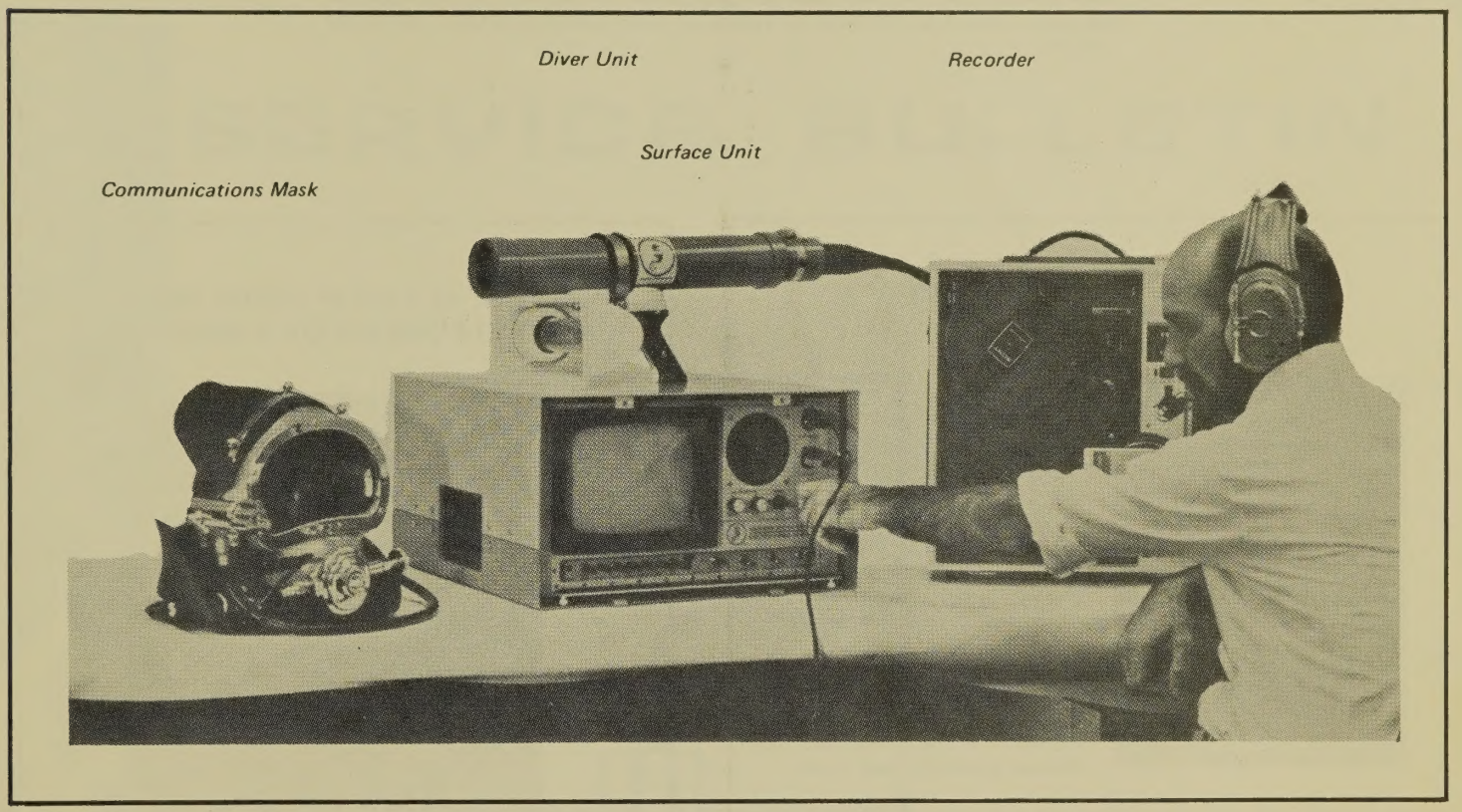
- *Dragage*
  7650 m³ (10 000³ verges) de roches à Murray Corner, pour le compte du ministère des Travaux Publics.
- *Carottages*
  Pour le compte d'Eastern Designers Ltd.
- *Renflouage*
  Pour le compte du Canadien Pacifique.
- *Installation et inspection de pipelines*
  Pour le compte de Miramich Timber Resources.
- *Installation de câbles*
  Pour le compte de Sieverts Kableverk (Stockholm).
- *Plongée*
  La compagnie fournit les plongeurs et l'équipement pour la plupart des interventions sous-marines.
- *Remise en état de navires*
- *Démolition*
  Travail aux explosifs.
- *Prévention et lutte anti-pollution*
- *Ingénierie*
  Conception et fabrication d'une drague pour le nettoyage des tranchées de câbles sous-marins. Pour le compte de Montréal Engineering Ltd.



Drague construite par Atlantic Marine Diving Co. Ltd pour le nettoyage des tranchées de câbles sous-marins.

Atlantic
AMD Marine and Diving Co. Ltd.

500 Beaverbrook Court
Fredericton, N.B.
Telephone: (506) 455-3720



DESCRIPTION

Although underwater television has been in use for quite some time, it has recently come into its own as a diver's tool for ship hull inspection and damage assessment due to the development of a simple, rugged closed-circuit audio/video system. Surface personnel can now inspect and assess damage with the diver and make permanent video tape records. The surface control station presents a television picture from a miniature underwater camera unit carried by the diver. Two-way telephone quality communications is also provided so the surface operator can direct the diver and discuss damage with him first hand. It was developed originally for the U.S. Navy for ship hull and sonar dome inspection and is now gaining wide use in commercial applications.

The complete diver inspection system is as simple to set up and operate as a portable television set. It includes a surface unit, recorder, diver unit (shown on top of the surface unit), and a communications mask. Audio and video signals are transmitted to the surface via a small 1/2" diameter cable.

The diver unit includes a self-contained television camera and light. The rugged, compact unit weighs less than five pounds in water and is easily handled by the diver. One of the most unique aspects of the system is its ability to see in low-light level environments and dirty water. Good video pictures have been obtained of ship hull condition or damage with divers reporting only one foot visibility!

The rugged surface unit includes all controls for system operation ... television monitor, remote camera focus control (3 inches to infinity), and direct on-line communications to the diver. Designed for the harsh environment encountered in most underwater inspection tasks, the surface control unit is completely splashproof with all seams and openings rubber-gasketed.

Permanent video and audio records can be made of a complete survey with the recorder included in the system. Instant playback can be accomplished by the flip of a switch and the video/audio recording can be played back in real time, slow motion or stop-action.

The 125 Diver Inspection System has become an invaluable accessory for the sophisticated working diver. It has enhanced his capability beyond simple damage assessment and inspection tasks to include "on-the-spot" engineering evaluation while in direct communication with surface personnel. The permanent audio/video tapes provided by the system can also be used as a "Quality Control" method for ship hull cleaning or underwater repairs.

Looking ahead to the time when the supertanker building program outstrips facilities for the repair and routine dry docking of tankers of 150,000 tons and upward, Lloyds of London has indicated that in its future operations underwater television may be undertaken as an alternative to the requirements for dry docking.

The 125 Diver Inspection System was DESIGNED FOR THE UNDERWATER ENVIRONMENT BY PEOPLE WHOSE BUSINESS IS THE UNDERWATER ENVIRONMENT ... one look and you'll see what we mean.

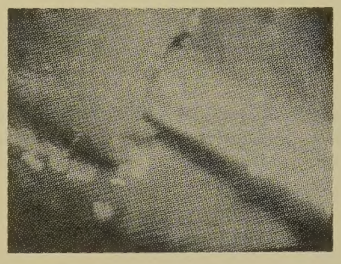
APPLICATIONS

Ship hull inspection and damage assessment has rapidly become the major COST SAVINGS application for underwater television. Closed circuit television cameras will be used to determine the extent of damage, or in the case of routine surveys, to assess the condition of the ship below the waterline, so that surveyors may decide whether docking is necessary.

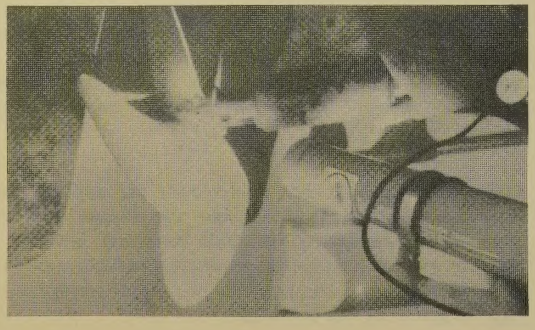
This is only a brief summary of some of the many applications for the 125 Diver Inspection System. If you have an application, contact one of our systems engineers — you'll get the most competent assistance available for any underwater problem.

SHIP HULL INSPECTION

Television is the "new tool" for shiphull inspection and repair.

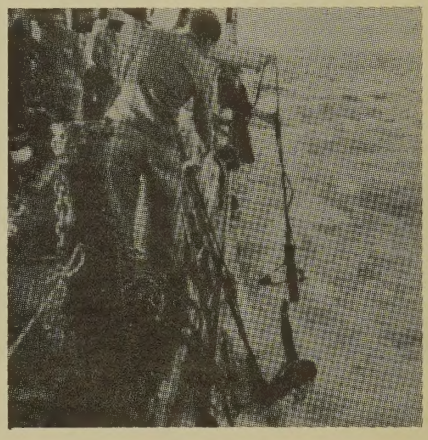


Photograph of a propeller shaft taken from a video tape replay of a survey made on a barge with suspected damage at Albina Shipbuilding/Portland, Oregon. The diver reported one foot visibility during this operation in the Klamath River.

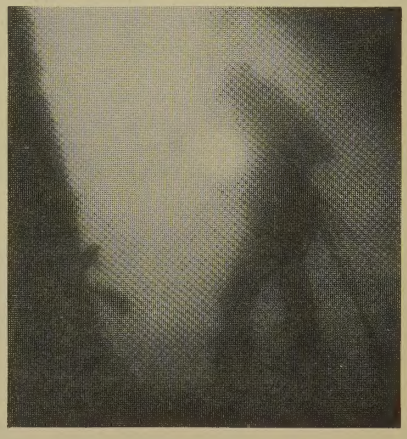


Lightweight and rugged, the underwater camera unit can be used for the closest detail inspections. The surface operator can remotely focus down to viewing distances of 3 inches.

VAST CLEANUP OPERATION FOLLOWS HILDA'S WAKE



PILING INSPECTION

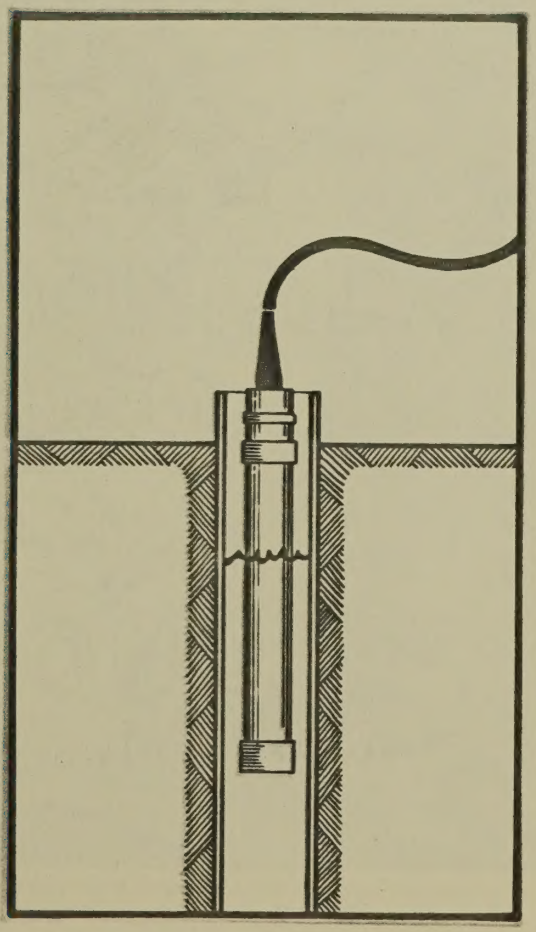


Bridge and dock piling inspection is a rapidly growing application for underwater television. With direct communications to the surface, the diver can discuss piling condition first hand with surface engineers. Permanent video tape recordings of the survey can provide a "quality control" method for the inspection.

AMD
Atlantic
Marine and Diving Co. Ltd.

500 Beaverbrook Court
Fredericton, N.B.
Canada E3B 5X4
Telephone: (506) 455-3720
Telex 014-46208

SERVICE BULLETIN



- TAKES THE GUESS WORK OUT OF DOWN HOLE PROBLEMS
- EFFECTIVE IN A WET OR DRY ENVIRONMENT
- 2000 FT. DEPTH CAPABILITY
- PERMANENT RECORDS CAN BE OBTAINED

in this case, so concrete can be poured to form supporting piers.

For the two brothers the work is natural. Ernest says he began in 1961 working at various types of construction. He was also interested in diving and eventually found there was sufficient work to combine the two and work at it full time. Now, as he administers company business, he finds he has little time for diving.

John McFadzen was exposed to above-water construction for several years prior to joining Atlantic Marine and Diving in 1973. The result is a company which combines all the elements of above-ground construction work with the ability to perform the work underwater.

Ernest McFadzen says the firm's current project is not really a major one although it has meant slightly more work than they had originally anticipated by studying construction plans.

The company has been involved with diving and construction on other provincial bridges, including the Burton Bridge, the Blackville Bridge and the ferry landing for the Princess of Acadian in St. John.

Between 1976 and 1977 when two 100-megawatt electric power cables were laid across 13 1/2 miles of Northumberland Strait, Atlantic Marine Diving Co. won a contract to provide underwater inspection of both cables during installation. With the cable-laying barge unable to come within 2,000 feet of either shoreline, divers also assisted in laying the first and last lengths of each cable.

On the Westmorland Bridge project, the company has also supplied some types of marine equipment for use on site, including sectional barges, a crane and a smaller landing barge. John McFadzen says most of the equipment is used as a need arises but forms part of the service they are able to offer to Modern-Armbro. He also says most types of equipment used for above-ground construction work can often be modified for use within the water.

In some cases, new techniques are developed for use. While installing water and sewage river crossings in Perth-Andover recently, the company made use of an old idea "which has been around for a couple of years" but which was used in a slightly different way to suit the project. The device was an eighteen-inch airlift for excavating trenches for the pipelines.

While the company is experiencing no difficulties with work on and around cofferdams for piers as required, cold weather can slow the work. Divers are forced to remain in the water for shorter periods of time. Equipment, such as air compressors, is also harder to start.

Although caution is always exercised, due to the lack of visibility there is always the danger a diver could become stuck around the cofferdams or have his air hose entangled. Inside the cofferdams, divers work in about 40 feet of water in virtual blackness. Unless a diver has a mental picture of where he is working in relation to his own movements, he could easily end up "turned around"

Generally, three divers work in a team at any one given time. "Basically, we do two types of diving," John McFadzen says. "Some jobs merely require scuba diving techniques while others involve surface, air and communications diving."

The second type of diving involves the use of air compressors to produce air for divers working for longer periods of time or for different tasks. Work on the steel substructure of the bridge frequently makes use of this diving system as divers work to cut H-pilings (supporting steel girders), at specified elevations or when divers provide underwater direction when mats of reinforcing steel have to be guided into place inside the cofferdams. About eight divers work at the busiest time of underwater activity, but generally numbers are adjusted to the job.

Atlantic Marine Diving Co. Ltd. will also carry out salvage operations as required and may sometimes be called upon to stop leaks in cofferdams. The company will continue to work on the project, probably finishing sometime in 1979. The length of the job will be directly dependent on bridge construction schedules along with any delays in the entire project, and subsequently their work. About 25 people are employed by Atlantic Marine Diving Co. but the figure varies from that peak from summer to summer.

Divers with the firm are trained on the job, although many have basic diving experience to begin with. They are trained in the use of equipment which enables the company to offer a wide variety of services, including submarine coresampling, underwater welding, photography, or closed circuit television along with salvage and pipeline installation and repairs.

The firm is continuing to expand. Recently, a Halifax company was purchased, along with a new 1,500-foot "saturation diving system" which is a sophisticated piece of equipment.

John McFadzen says one rule of the underwater world is, the deeper you go, the more complex the equipment to work in that environment becomes.

For Atlantic Marine Diving Co. the depths of the St. John River pose no particular problems in their work on the Westmorland Street Bridge and, undoubtedly, they are looking forward to even bigger and more varied projects, in the future. □

Atlantic Marine & Diving Co. Ltd.,
500 Beaverbrook Court
Fredericton, N.B.
E3B 5X4
Tel.: 506 - 455-3720

HEAVY CONSTRUCTION NEWS

DECEMBER 19, 1977

CONSTRUCTION TODAY / Canada

Sulphur asphalt paving tested on Alberta highway project

Concrete set for metric move

James Bay on year-end target, hectic earthfill pace at LG-2

Maintenance looks at diesels and the trend to easy access

13½-mile-long underwater cables had to be buried for power link in Maritimes

Published by Maclean-Hunter Limited ISSN 0017-9426

Trenching and ploughing protect twin cables from ravages of Northumberland Strait . . .

Undersea power link buried for 13½ miles

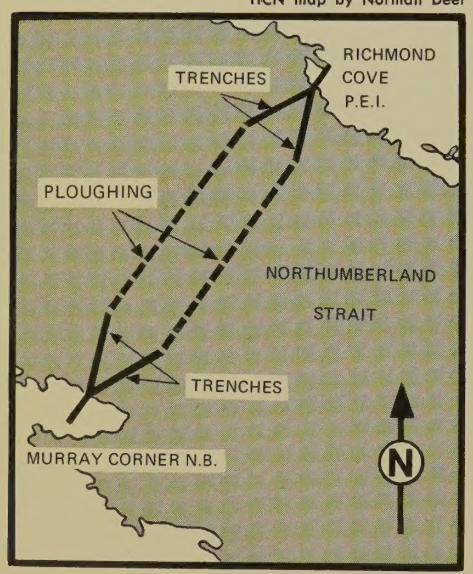
Prince Edward Island's answer to the rising demand for electric power in the province: "plug into" New Brunswick's power system 13½ miles (21.7 km) across the Northumberland Strait.

Two 100-megawatt cables were laid across the strait this summer — an exercise in provincial co-operation that will enable P.E.I. to benefit from advances in power development which are being made on the mainland.

At first glance, the cable link seems a simple solution, but people who worked on the $39.2-million project point out that it provided its full share of headaches.

The oil-filled cables went into operation in mid-September — one year late because of the cable supplier's manufacturing problems in Sweden. Both cables are technically operable but only one is supplying power to the island at present; the other is on standby.

HCN map by Norman Deer



Northumberland Strait is not an ideal location for laying a power cable. In winter the strait becomes choked with massive ice floes which scour the seabed within 2½ miles (4 km) of the New Brunswick shoreline and within 1½ miles (2.4 km) of the P.E.I. coast.

The rest of the year, commercial fishermen work inside the strait, and the entire seabed is disturbed by fishing gear.

For these reasons the engineering consultants on the cable project, Montreal Engineering Co. Ltd., decided that not only would the cables have to be buried for their entire length of 13½ miles, but two separate methods would have to be used. The company also stipulated that the cables would have to be laid inside 6 ft deep (1.8 m) trenches, well below the ice scouring, and 20 in. (508 mm) into the seabed to stay clear of fishing equipment.

Completely buried

Within the ice-scoured areas, which amounted to 4 miles (6.4 km) for each cable (roughly 30% of its entire length), the cables would have to be buried in trenches dug by dredges. The remainder of each cable — 9½ miles (15.2 km) — would have to be buried just below the sea floor, using a special underwater plough.

The route of the cable-laying operation started at Murray Corner, N.B., and extended northeast to Richmond Cove, P.E.I. (see map). It runs north of the island-mainland ferry route.

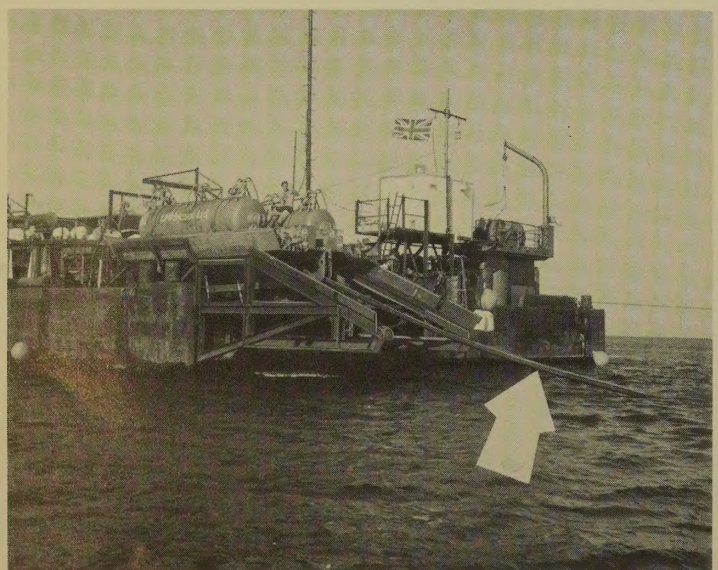
Largest contract on the overall project — worth $22 million — was awarded to Sieverts Kabelverk of Sundyberg, Sweden, for supply and installation of the two 5 in. dia (127 mm) cables. A subsidiary of L. M. Ericsson Group of Sweden, the firm worked on the cable project through the Canadian subsidiary, L. M. Ericsson Ltd. of Montreal.

Project management was handled by the Montreal company, together with Montreal Engineering.

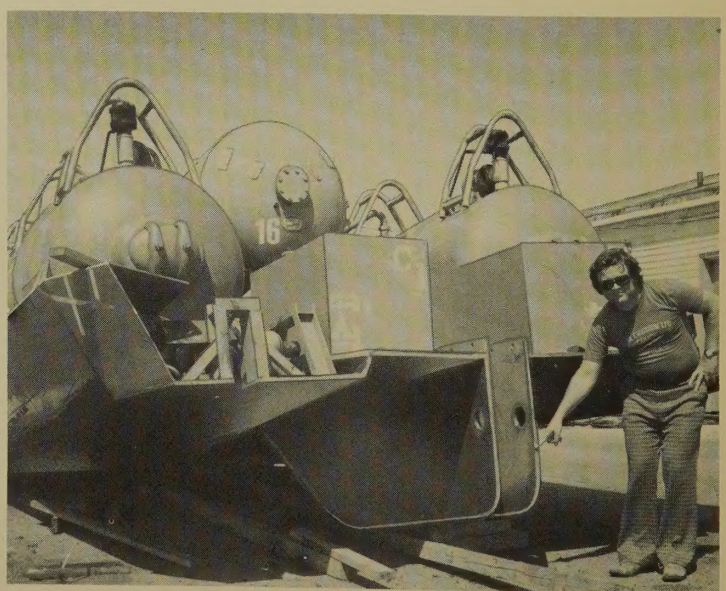
Smith International Marine Services BV of Rotterdam, Holland, was the prime marine contractor for Sieverts, and supplied the barge Mulus IV, a 225x75 ft (69x23 m) vessel equipped with two 64 ft dia (19.5 m) carousels for unreeling the cables across the strait. Each carousel, with 13½ miles of cable, weighed more than 1000 tons (907 tonnes).

The cable-laying barge was also equipped with cooking and sleeping quarters for the crew of 80. A special off-reeling system was set up on the barge so that a cable would never be overstressed in tension. Rather than have a cable off-loaded directly from the barge's stern, the off-reeling system was designed so that the cable would first go to the bow, and pass almost around the entire barge on an elevated rack before it entered the water at the stern.

When the barge brought the cables to the strait early this summer they were



CABLE (arrow) enters marine trench from the barge's stern.



CUTTING EDGE of underwater plough is shown by Thompson.

under a continuous oil pressure, which was kept up during the cable-laying and will be maintained during the operational life of the cables. The pressure system serves as an internal alarm system; an oil leak will quickly alert operators to underwater damage or rupture.

Hugh Thompson, Ericsson's project manager, says the cable-laying work was scheduled for the summer to avoid stormy weather. If a storm had developed, the cable barge would have had to remain anchored in one spot with the cable running off the barge's stern. Either cable could have easily suffered fatigue damage from continual flexing even though it weighed 100 lb/yard (49.6 kg/m). However, excellent weather stayed with the Sieverts Kabelverk crew all summer and only seven days were required to lay each cable.

Eight heavy anchors

The major part of the cable-laying operation required the Mulus IV to be winched along the route, using eight large-diameter anchor cables. In order to keep the barge accurately on course, despite strong currents, eight heavy anchors were required; two weighed 5 tons (4.5 tonnes) each, the six others each weighed 3 tons (2.7 tonnes).

A pair of 4000 hp (2584 kW) tugs, among the largest ever to enter Canadian waters, continually reset the anchors. The 180 ft long (55 m) tugs were supplied by Smit International. Smaller tugs and other marine equipment were supplied by firms in the Maritimes.

Atlantic Marine Diving Co. of Fredericton, which had been involved since 1972 in various marine testing programs associated with the project, won a contract for underwater inspection of both cables during installation. And because the cable-laying barge could not come within 2000 ft (610 m) of either shoreline, the divers assisted in laying the first and last 2000 ft lengths of each cable.

The Atlantic Marine crew first installed a pair of 40 000 lb capacity (18-120 kg) winches — one on each shoreline — for hauling in the first section of cable from the cable-laying barge as it lay anchored off the New Brunswick shore. Oil drums were secured to the cable as it was winched to shore so that it could be accurately positioned over the trench.

The trenches, which were 2½ miles long on the New Brunswick side, and 1½ miles long at the P.E.I. end, were dug in summer 1975 in anticipation of a 1976 cable installation program. The 1975 marine work was executed by a joint venture of two Toronto firms, McNamara Marine division of McNamara Corp. Ltd. and Canadian Dredge & Dock Co. Ltd.

However, because the cable-laying project was postponed, the two-year-old trenches had to be redug this summer to clear them of silt and seaweed. This new work was carried out by a joint venture of two Montreal firms, Beaver Marine Ltd. and Verreault Navigation Ltd.; they were also responsible for backfilling the trenches. Cleaning the P.E.I. trenches was done in one continuous operation but, because of strong currents skirting the New Brunswick coast, the trenches on that side had to be cleaned just ahead of the cable laying.

Once 2000 ft of cable had been floated, the divers cut the barrels away, enabling the cable to sink into its trench.

Underwater inspection of the cables required strong illumination, using lights on the barge in shallow water and underwater lights for greater depths. The divers also made underwater videotapes during various phases of the inspection.

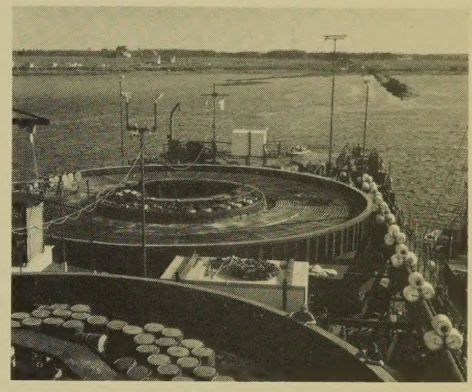
The underwater inspection was also required around-the-clock on each 9½-mile-long ploughing stretch in the middle of the strait.

Sieverts Kabelverk designed the 23 ft long, 10 ft wide (7x3 m) underwater plough, resembling a small barge with its compressed air tanks which enabled the 13-ton (11.8 tonne) unit to be easily raised from the seabed. The plough was first put into action at the end of the first 2½-mile-long New Brunswick trench where the depth of water was about 40 ft (12 m).

A cable was first threaded through the plough before the unit was lowered into the water from the cable-laying barge. Across 70% of each cable route the plough simultaneously dug a narrow trench and lowered the cable into it.

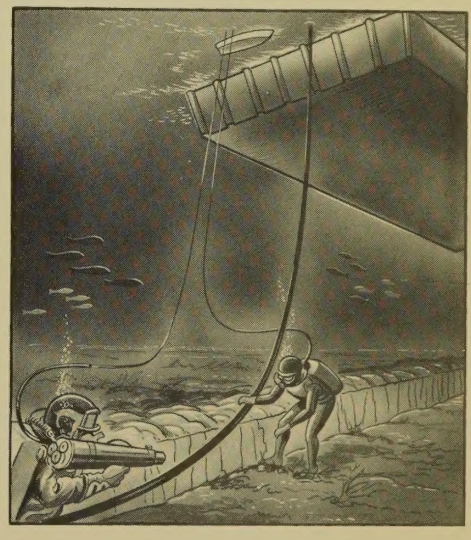
The plough was equipped with two pendulums which measured the roll and pitch of the unit, while a recording machine on the deck of the Mulus IV automatically recorded its movement. At the centre of its route, the plough worked in about 100 ft (30.5 m) of water.

As soon as a cable was 2000 ft

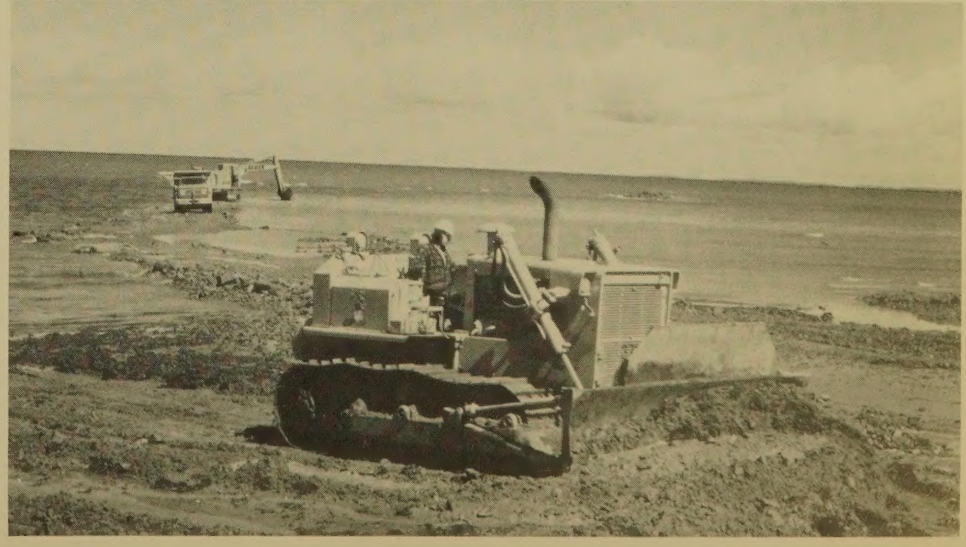


VIEW of twin carousels, one empty and one full, on cable-laying barge.

HCN drawing by Norman Deer from original sketch by Atlantic Marine Diving Co.



VIDEOTAPES are taken by divers as a cable enters a freshly dug trench.



CABLE TRENCH at New Brunswick shoreline is backfilled by Beaver Marine Ltd.

from the P.E.I. shoreline the initial cable-laying procedure was reversed, the barge was turned parallel to the shore and the rest of the cable was floated inshore with oil barrels.

According to Ericsson's project manager, Hugh Thompson, each cable was laid at the rate of 120 ft per hour (37 m/h) for the trench work and 1200 ft/hr (370 m/h) for the ploughing work.

The cables are the property of the P.E.I. Department of Industry and Commerce which, in turn, has leased their operation and maintenance to Maritime Electric Co. Ltd. of Charlottetown, a private utility company.

Before the 100-megawatt cables began bringing power from the mainland, the total power output of P.E.I. was developed from three thermal plants on the island which produced 115 megawatts of power: a 70.5-megawatt oil-fired plant at Charlottetown, a 38.5-megawatt gas turbine plant at Borden, and a 6-megawatt diesel plant at Summerside. ♠

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ROBERT W. TURNER

EDUCATION: B.A.Sc. University of Toronto 1963
M.A. University of Toronto 1966

EXPERIENCE:

Feb. 78 - Present — R.W. Turner & Company, Sole Proprietor

The company provides engineering consultant services in the field of diving and hyperbaric technology; to undertake design, evaluation and test of diving support equipment and systems, and underwater work equipment.

Jan. - Sept. 77 — Caribbean Watersports, Dickenson Bay, Antigua, W. I.

Chief Diving Instructor
Responsible for sport diving operations of the company (i.e. for equipment maintenance and control, for instruction and for planning and control of sport diving charters).

June 76 - Jan. 77 — Fuller Manufacturing Ltd., Antigua, W.I.

Chief Diver
Responsible for underwater construction of a marine slipway, for all underwater work requirements during slipway operations, and for harbour diving operations under contract to the Antigua government.

... con't

Dec. 68 - Apr. 76 Canadian Armed Forces

Mr. Turner spent seven years as an officer in the Bioscience and Maritime Engineering Branches. In that time he served at the Defence and Civil Institute of Environmental Medicine (DCIEM) in Toronto, and in the Directorate of Maritime Equipment Engineering (DMEE) at National Defence Headquarters.

While at DCIEM from 1968 to 1973, Mr. Turner was responsible for the following projects:

- Test and trial of diver life support equipment (e.g. helmets, various types of breathing apparatus, dry suits, heated suits, underwater intercommunications). In most instances, comparative evaluation was conducted upon commercially available equipment with a view to applicability for use by Canadian Forces Divers.

- Development of planned maintenance schedules, and upgrading of DCIEM recompression chambers. Mr. Turner was also a subject in various research projects, such as development of decompression schedules and experiments in hyperbaric pulmonary ventilation.

While at DMEE from 1973 to 1976, Mr. Turner was responsible for the following projects:

- Technical specification of deep diving support equipment and deck decompression complex proposed for deep lockout operations from the Canadian Forces submersible SDL-1.

...con't

- Technical management of diving equipment in use by the Canadian Forces. This included direction of funding for and liaison with groups (primarily DCIEM) conducting development and evaluation of new equipment; specification and phasing in of new equipment for operational diving equipment. The equipment included underwater power tools, and diver life support equipment for surface controlled diving and lockout operations from the submersible SDL-1.

- Life Cycle maintenance management of Canadian Forces recompression chambers. (Total of seven, at Halifax and Esquimalt).

During his Canadian Forces service, Mr. Turner was required to attend symposia and meet with personnel of manufacturers and diving service companies, both in North America, the U.K. and Europe.

May 68 - Aug. 68 West Indies Oil Company Ltd., St. John's Antigua, W.I.

Chief Diver
Responsible for construction, inspection and maintenance of underwater pipelines and other installations. Responsible for all underwater work in the clearance of a wrecked tug from the harbour approaches of St. John's, Antigua.

STEVEN H. JOHNSON

Personal

Age: 30
Height: 5'11"
Weight: 160 lbs.

Citizenship: Canadian EC489184
Marital Status: Married

Experience

1979 - Present — Underwater Services, Inc., Houston, Texas

Position: President
Responsibilities: Marketing, and technical and operational support

1978 - 1979 — VePa Ventures, Inc., North Delta, B.C.

Position: President
Responsibilities: All phases of operations planning and on the site management for underwater consulting company

1973 - 1978 — Hyco SubSea Ltd.

Position: Vice-President/General Manager
Responsibilities: -Trialling on new submersibles
-Scientific studies
-Training of pilots

1972 - 1973 — Can Dive Ltd., St. John's, Newfoundland

Position: Diver
Responsibilities: -Diving tasks routinely associated with offshore drilling
-Electrical and electronic repairs to equipment
-Underwater burning surface welding and general equipment maintenance

1972 — International Hydrodynamics, North Vancouver, B.C.

Position: Senior pilot in charge of operations
Responsibilities: -All phases of maintenance on the submersible
-Electrical/electronic maintenance

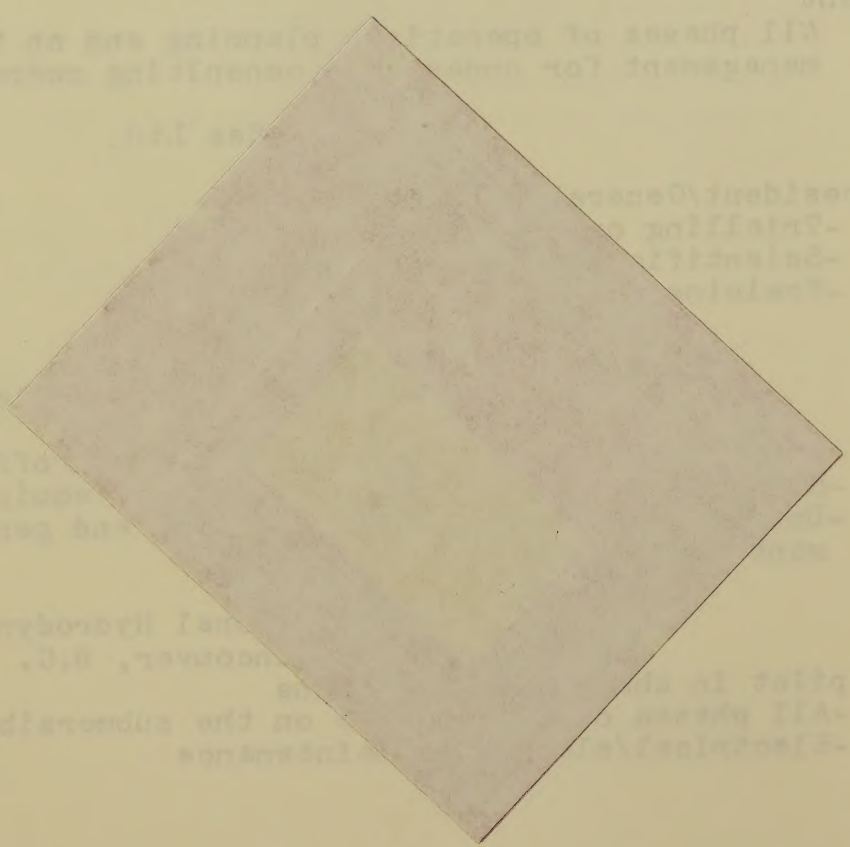
Education

1971 - 1972 — Commercial Diving Center, Wilmington, California

1966 - 1971 — Royal Canadian Navy, Canada

References

furnished upon request



RESUME

Peter H.F. Sare - 271 Saunders St.
Fredericton, N.B.
E3B 1N5
(506) 455-3508

PERSONAL

Birthdate: October 6, 1947
Status: Married, no dependents
Health: Excellent

EDUCATION

1965 - Graduated High School, Ottawa, Ontario
1970 - Bachelor of Business Administration
St. Francis Xavier University
Antigonish, N.S.
1975 - Commercial Deep Sea Diving Certification
Divers Training Academy, Fort Pierce,Florida
Honour Graduate

EMPLOYMENT SUMMARY

1970-71 (Sept.-March) — Rapid Data Systems & Equipment Ltd.
Courtwood Cres., Ottawa, Ont.

Sales Representative for a line of postage me

1971-72 (Sept.-Feb) — Industry, Trade & Commerce
Tower B, Place de Ville
Ottawa, Ontario

Researching newspapers, periodicals, interdepartmental telexes to provide material for an information system being set up to aid the Program for Export Market Development.

1972-73 (Sept.-April) — Industry, Trade & Commerce
Tower B, Place de Ville
Ottawa, Ontario

Administrative position with the Program for Export Market Development, Incentives for Participation in Capital Projects abroad. The work involved all aspects of administering applications made to the program, including initial assessment, distribution to departmen branch concerned, decision committee meetings and followup liason with the company.

1974-75 (May-March) — Mt. Newman Mining Co. Pty. Ltd.
Mt. Newman, W.A. Australia

Ore truck operator for 120 ton Haulpak in world's largest open pit iron ore mine.

EMPLOYMENT SUMMARY (Cont'd)

1976 (Jan.-July) — Milne and Lindberg Marine, Ft. Langley, B.C.

Abalone Diver on the Northern British Columbia coast.

1976-77 (Aug.-Feb.) — J.W. Gray & Son Pty. Ltd., Sydney, Australia

Diver for general marine contractor. Work included installation of underwater effluent pipeline for an oil refinery, inspection and maintenance of oil unloading facilities, and fabrication and maintenance of shark barriers.

1977 (Mar.-Apr.) — Holt and Winsby, Ladysmith, B.C.

Abalone Diver on the Northern British Columbia coast.

1977 (June) — Sub-contract to Callaghan Contracting Ltd. Moncton, N.B.

Installation of underwater effluent pipe for Dalhousie, N.B. Sewage Treatment Plant.

1977 - Present — Atlantic Marine & Diving Co. Ltd. Fredericton, N.B.

Employment was interrupted for several periods of extended travel abroad.
1972 - 6 months in Europe
1973-74 - 9 months Europe to Australia which included 6 months seasonal work for U.S. Army in Germany
1975 - 3 months South East Asia
1976 - 1 month New Zealand and South Pacific
1979 - 3 months South America

INTERESTS - Skiing, Running, Reading, Travel

REFERENCES - Available on request.

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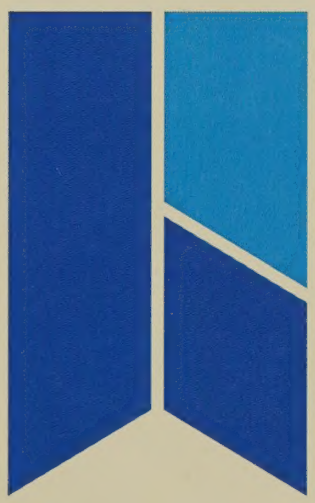

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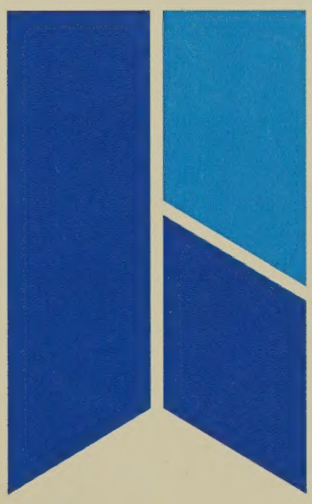

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ROBERT J. STARR

Personal

Age: 29
Date of Birth: 4/5/50
Place of Birth: Ft. William, Ontario, Canada

Citizenship: Canadian KE558118
Height: 6' 1"
Weight: 160 lbs.
Marital Status: Married

Experience

1979 to Present — Underwater Services, Inc., Houston, Texas

Position: Chairman of the Board
Vice-President/Operations
Responsibilities: Marketing: and technical and operationsl support

1979 to Present — Diavaz, Mexico City, Mexico

Position: Vice-President
Responsibilities:
- All phases of operations planning including personnel and equipment deployment and associated logistics
- On site management of all operations
- Development of all operational procedures including safety aspects
- Contract negotiation and client liaison on site
- Personnel selection

1977 to 1979 — Martech International, Inc., Houston, Texas

Position: Operations Manager
Responsibilities:
- All phases of operations planning including personnel and equipment deployment and associated logistics
- On site management of all operations
- Development of all operational procedures including safety aspects
- Development and implementation of pilot training programs including testing and certification.
- Preparation of operations budgets and administration of same
- Personnel selection
- Assistance in the development and implementation of Marketing Strategy

1974 to 1977 — Hyco Subsea Ltd.

Position: Operations Manager
Responsibilities:
- All phases of operations planning including personnel and equipment deployment and associated logistics

Education

Graduate - Handsworth Senior High School
Diploma - Northwest School of Deep Sea Diving
Diploma - Divers Institute of Technology
Diploma - Coastal School of Deep Sea Diving
Diploma - Brooks Institute (Underwater Photography)
Associate of Applied Science Degree - Washington State
Undersea Technician - Highline Community College

Affiliations

Deep Submersible Pilots Association
Member - Undersea Vehicle Safety Committee
Member - American Bureau of Shipping Submersible Committee

References

References will be supplied upon request

T. J. FOULKES - RÉSUMÉ

Personal Details:

Canadian Male, Born in Montreal, Jan. 8, 1938

Height: 6'0", Weight: 150 lb., Health: Excellent

Domestic Status: Single, Divorced, 3 Dependents

Education:

Mount Royal High School, QHSL Certificate 1955.

McGill Mechanical Engineering, 1955-58 (to 3rd yr.)

Ryerson Mechanical Technology, 1959-61 (Diploma)

Experience:

1. Canadian Aviation Electronics, Montreal, 1961-62
   Quality Control Lab Technician 13 months

2. N. Z. Gov't. DSIR. Lower Hutt, N.Z. 1963-64
   Technologist, Electrochemical Machinery
   Research and Development 14 months

3. Fisheries Research Board of Canada, St. Andrews, N. B. 1964-73.
   Technicain, Fishing Gear Engineering Research: - Development, operation and maintenance of underwater and on-deck instrumentation for study of commercial trawls; provision of engineering support and specialized equipment for Fisheries Research.

4. Department of Fisheries and Oceans, St. Andrews, N.B. 1973-onward
   Engineer-Technologist, Marine Technology - Provision of engineering support for laboratory, field and plant operations at the St. Andrews Biological Station, specializing in the development of marine vehicles and underwater camera equipment.

Special Interests:

Alternate energy sources and systems, mechanical and ocean engineering, underwater optics and vehciles, interpersonal relationships, philosophy, personal growth, sailing, skiing, hiking and skin diving.

PUBLICATIONS - T. J. FOULKES

Carrothers, Foulkes, Connors, and Walker. 1969. Data on the engineereing performance of Canadian east coast groundfish otter trawls. FRB Canada Tech. Rept. No. 125.

Carrothers, P. J. G., and T. J. Foulkes. 1972. Measured towing characteristics of Canadian east coast otter trawls. INCAF Research Bulletin No. 9.

Foulkes, T. J. 1972. Design and performance of TUACS: Towed underwater, automatic camera sled. FRB Canada Tech. Rept. No. 292.

Foulkes, T. J., and D. J. Scarratt. 1972. Design and performance of TURP - a diver controlled towed underwater research plane. FRB Canada Tech. Rept. No. 295.

Foulkes, T. J., and J. F. Caddy. 1972. DUCCS - A collapsible underwater camera sled for sea-bed photography from a drifting support vessel. FRB Canada Tech. Rept. No. 310.

Foulkes, T. J., and J. F. Caddy. 1973. Towed underwater camera vehicles for fishery resource assessment. Underwater Journal IPC Science and Technology Press Ltd.

Foulkes, Polar, Babineau, and Carrothers. 1974. Instruction manual for modified EG&G 200A/210A automatic underwater, photographic system.

UNPUBLISHED MANUSCRIPTS

Foulkes, T. J. A recirculating hydraulic flume for studies of fish behavior and underwater instrumentation 1970-79.

Foulkes, T. J., and S. M. Polar. The Development of a bottom-referencing underwater towed instrument vehicle, "BRUTIV," for fisheries research and sea-bed surveys - 1971-79.

Foulkes, T. J. A new neuston net plankton survey vehicle with replaceable moulted polyurethane floats. Designed in 1969, produced in 1978.

Foulkes, T. J., and U. Buerkle. A floating underwater acoustics calibration tower for determining target strengths of fish. (Operational since 1975.)

Foulkes, T. J. Bomb-type lead alloy depressors replace awkwrd V-fins for plankton surveys, 1977.

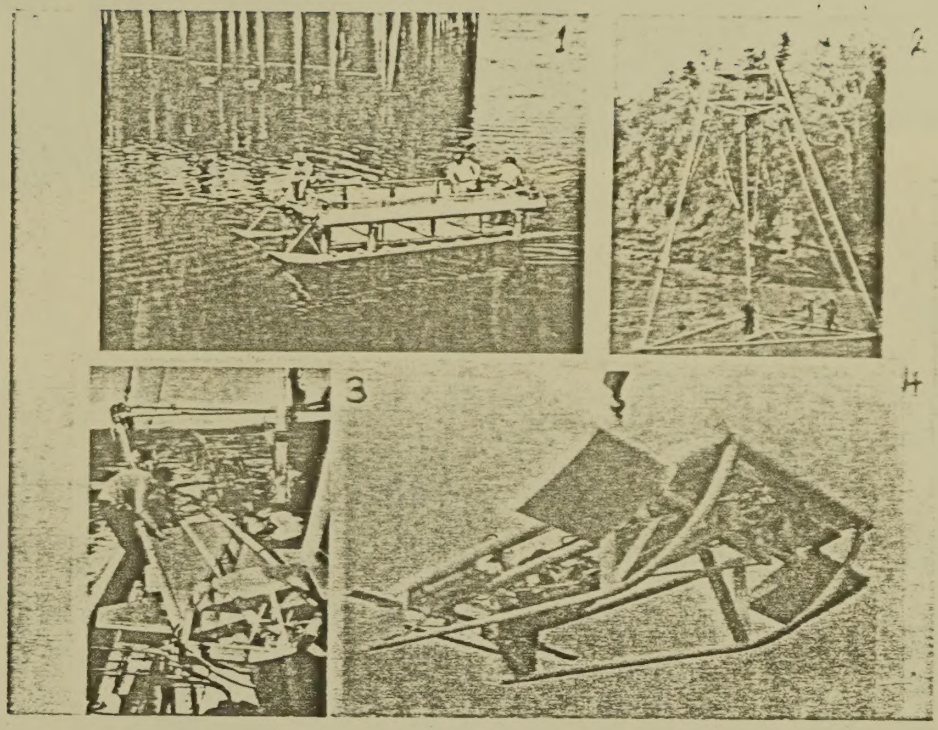
Foulkes, T. J., and C. Dickson. A variable buoyancy tagging barge for use among east coast herring weirs. 1979.

SPECIAL PROJECTS FOR 1980

1. Development of new benthos 200 watt-second 35 mm underwater strobe camera with digital data acquisition system for BRUTIV sensors, Rebikoff "Big Eye" lens, remote power supply, and special light-weight cases.

2. Design for new BRUTIV control, data acquisition, and TV systems using power handling RF co-axial tow cable, and proposal for simplified and integrated Mark III design.

3. Development of floating fish cage for commercial aquaculture of salmon in the Bay of Fundy.



1. Variable buoyancy tagging barge manoeuvring into position on the surface before flooding pontoons. (1979)

2. Floating acoustics tower, - final assembly on the beach. (1975)

3. TURP (diver operated towed underwater research plane) and TUACS (towed underwater automatic camera sled) being readied aboard MV Pandalus before V/W survey. (1971)

4. BRUTIV II (bottom referencing underwater towed instrument vehicle) ready for sea-bed camera surveys. (1978)

Enlargements and details available from T. J. Foulkes

T. J. Foulkes.

January 11 / 1980

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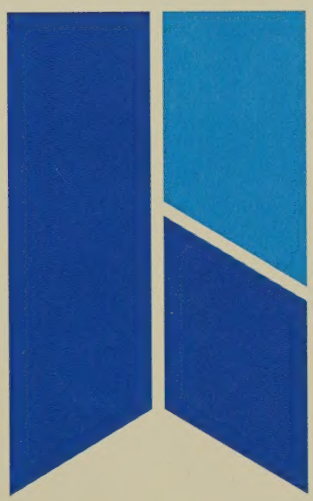

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